Temperature dependent power controller

By using a 723C i.c. regulator as a sense-bridge, a low-cost water temperature controller can be constructed. The base-emitter junction of a BC183B senses the water temperature and gives a base-emitter voltage variation of about 2mV per deg C in the range 0 to +100 deg C. This voltage change is amplified in the collector circuit and applied to the non-inverting input of a comparator within the i.c. A voltage set by R_2 is applied to the inverting input, and determines the sensor temperature at which the comparator switches its output positive. A stable supply for this part of the circuit is provided by V_{ref}. Rectified a.c. is applied to the CL input through a delay network R_4C which allows a positive pulse to pass from the comparator to V_o just after the zero-crossing point of the applied a.c. This pulse drives the triac via a transformer of 36 s.w.g. wound on a 1in × ⅜in ferrite rod.

Positive feedback around the comparator is applied through isolating diode V_z which ensures that feedback is only effective when a pulse appears at the output. A 0.5Hz triangular wave, generated by IC_2, is applied to the input of the comparator and provides proportional pulse width modulation. The amplitude of this waveform defines the proportional bandwidth of the controller, which is 0.5deg C with the values shown.

Control of a three gallon well-stirred water bath at 40 deg C is better than ±0.05 deg C. A thermistor may be substituted for the transistor to give a wider temperature range and less sensitivity to ambient temperature.

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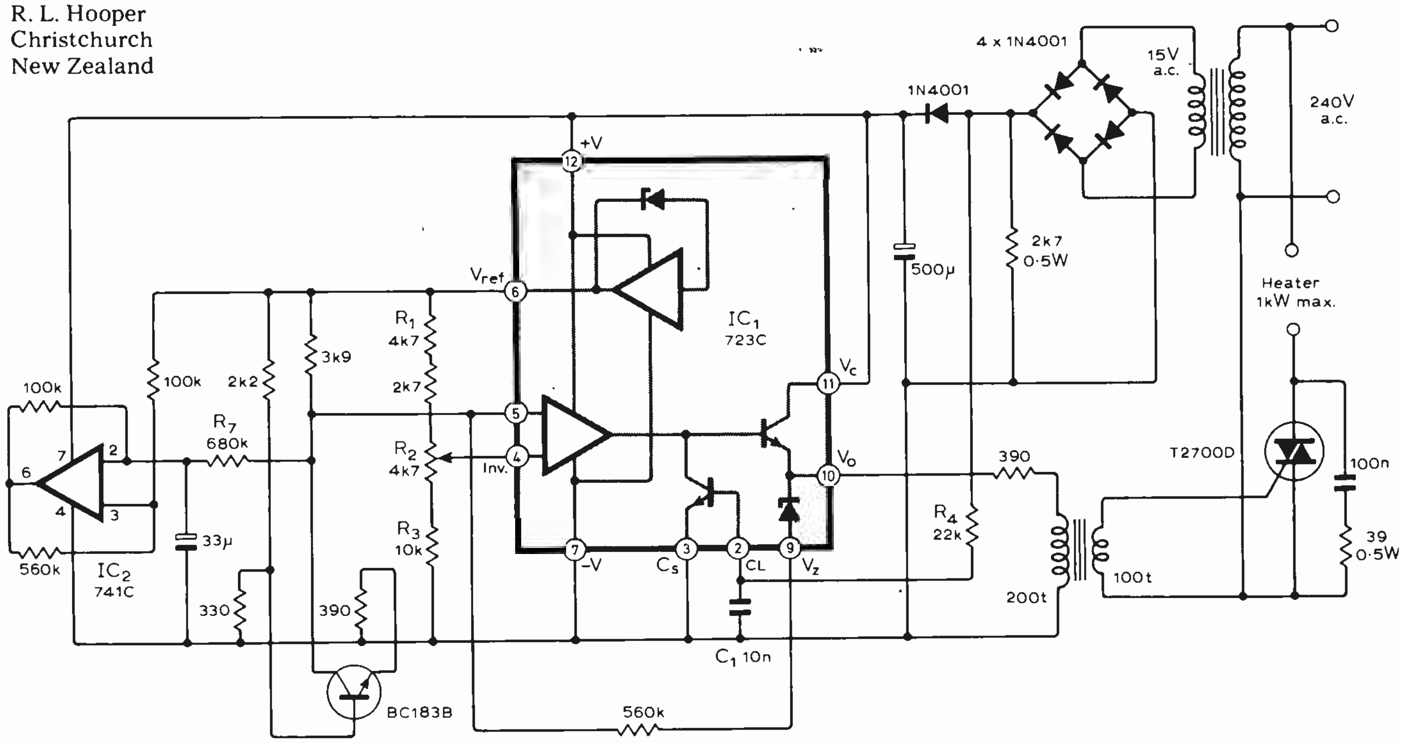

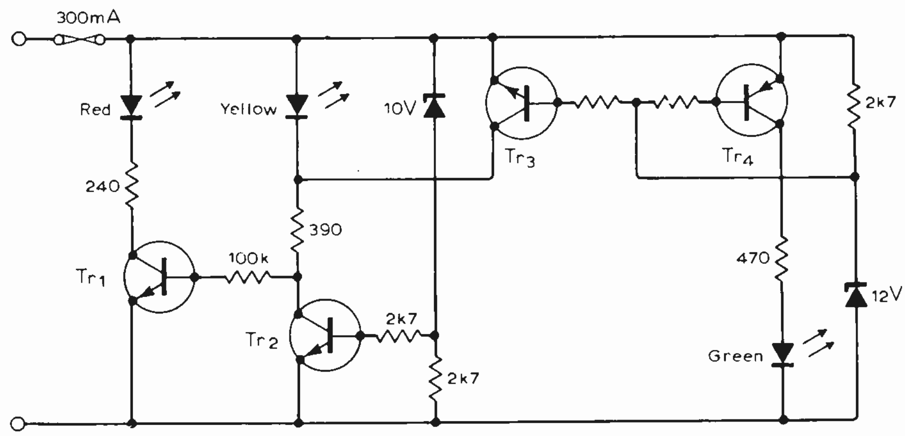

Automotive voltage indicator

An indication of battery voltage is useful to the motorist for monitoring the battery's capacity to delivery current, and as a check on the efficiency of the dynamo or alternator. This circuit is a solid-state alternative to a moving coil meter. The table shows the outputs obtained over the critical range of 10 to 14V.

When the input is below 10V, Tr_2, Tr_3, and Tr_4 are off and Tr_1 is turned on. As the voltage rises the 10V zener diode begins to conduct, Tr_2 receives base current and turns Tr_1 off.

At approximately 11V both Tr_1 and Tr_2 are on, but at 12V only Tr_2 is on. Similarly, Tr_4 is turned on as the voltage rises to 14V and the 12V zener conducts.

Transistor Tr_3 takes current from the yellow l.e.d. and turns it off while Tr_2 remains in conduction to keep the red l.e.d. off. The circuit can be easily modified for different voltages by changing the zener diodes.

Red	Yellow	Green	Voltage
1	0	0	⩽10V
1	1	0	11V
0	1	0	12V
0	1	1	13V
0	0	1	⩾14V

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